What We Claim Is:

1.   A method for carrying out gear shifting in a twin-clutch transmission having at least two transmission input shafts, each of which is coupled via a clutch to the engine, wherein after recognition of a desire to shift, the clutch assigned to the transmission input shaft that is transmitting the torque is disengaged up to the slip limit and the engine torque (T_{eng}) is driven as a function of the type of shifting in order to achieve a vehicle acceleration desired by the driver.

2.   The method as described in Claim 1, wherein an additional torque is used to achieve the vehicle acceleration desired by the driver.

3.   The method as described in Claim 2, wherein the torque (T_{emotor}) of an electric motor is used as an additional torque.

4.   The method as described in Claim 3, wherein, in the driving of the torque (T_{emotor}) of the electric motor, the required vehicle acceleration is determined as a function of specific vehicle and/or transmission variables, so that a target torque of the electric motor is calculated and the calculated target torque of the electric motor is used if the target torque is within predetermined minimum and maximum limit values.

5.   The method as described in Claim 3, wherein, when the torque (T_{emotor}) of the electric motor is insufficient, the clutch torque of one of the two clutches is used to control the vehicle acceleration.

6.   The method as described in Claim 1, wherein the type of shifting is determined shortly before the beginning of the shift.

7.   The method as described in Claim 6, wherein, when a clutch is disengaged and when a slipping or gripping clutch is brought into the slipping state by a decrease of the clutch torque of the clutch that is transmitting the torque, it being decided at the beginning of the slip phase of the clutch whether the drive train is under pulling load or pushing load in which a check is made of when the slip is positive or negative on the clutch that is transmitting torque.

8.   The method as described in Claim 7, wherein when there is positive slip on the clutch that is transmitting torque, if the engine speed (ω_{eng}) is somewhat larger than the speed of the active transmission input shaft ($\omega_{inpshaft}$), a pulling load is present, and when there is negative slip, if the engine speed (ω_{eng}) is somewhat smaller than the speed of the active transmission input shaft ($\omega_{inpshaft}$), a pushing load is present.

9.   The method as described in Claim 6, wherein when the clutch is gripping a check is made of whether the entered engine torque (T_{eng}) is larger than the dynamic engine torque $\left(\dot{\omega}_{eng} \cdot J_{eng} \right)$.

10.   The method as described in Claim 9, wherein if the entered engine torque (T_{eng}) is larger than the dynamic engine torque $\left(\dot{\omega}_{eng} \cdot J_{eng} \right)$ the twin-clutch transmission is in pulling mode, the engine being accelerated if the engaged clutch is disengaged, and if the entered engine torque (T_{eng}) is less than the dynamic engine torque $\left(\dot{\omega}_{eng} \cdot J_{eng} \right)$, the twin-clutch transmission is in pushing mode.

11.   The method as described in Claim 6, wherein the state is considered in which none of the clutches is in the gripping state.

12.   The method as described in Claim 11, wherein the transmitted clutch torque ($T_{clA/B}^{transferred}$) is determined from the minimum value of the particular clutch torque $T_{clA/B}$ that is set and the slip limit of the particular clutch ($T_{clA/B}^{slip}$).

13.   The method as described in Claim 11, wherein in pulling mode the following formula applies:

$$sign\left(\omega_{eng} - i_A \cdot \omega_{vehicle}\right) \cdot i_A \cdot T_{clA}^{transferred} + sign\left(\omega_{eng} - i_B \cdot \omega_{vehicle}\right) \cdot i_B \cdot T_{clB}^{transferred} \geq 0$$

and in pushing mode the following formula applies:

$$sign\left(\omega_{eng} - i_A \cdot \omega_{vehicle}\right) \cdot i_A \cdot T_{clA}^{transferred} + sign\left(\omega_{eng} - i_B \cdot \omega_{vehicle}\right) \cdot i_B \cdot T_{clB}^{transferred} < 0$$

whereby,

$\omega_{vehicle}$ = vehicle speed,

i_A = overall ratio of the gear of the first input shaft,

i_B = overall ratio of the gear of the second input shaft,

$T_{clA}^{transferred}$ = transmitted clutch torque of the first clutch and

$T_{clB}^{transferred}$ = transmitted clutch torque of the second clutch.

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14. The method as described in Claim 1, wherein the slip limit (T_{clA}^{slip}) of the clutch is determined according to the following formula:

$$T_{clA}^{slip} = \left| T_{eng} - J_{eng} \frac{T_{eng} + \dfrac{T_{vehicle}}{i_A} - \left|\dfrac{i_B}{i_A} - 1\right| \cdot T_{clB}}{J_{eng} + \dfrac{J_{vehicle}}{i_A^2}} - sign\left(1 - \frac{i_B}{i_A}\right) \cdot T_{clB} \right|.$$

10   15. The method as described in Claim 14, wherein the external vehicle torque ($T_{vehicle}$) of the vehicle is determined for determination of the slip limit (T_{clA}^{slip}).

16. The method as described in Claim 15, wherein the external vehicle torque ($T_{vehicle}$) of the vehicle is determined when the clutch is gripping and slipping according to the following

15   formula:

$$T_{vehicle} = i_A \cdot \left[\dot{\omega}_{eng}\left(J_{eng} + \frac{J_{vehicle}}{i_A^2}\right) - T_{eng} + \left|\frac{i_B}{i_A} - 1\right| \cdot T_{clB} \right].$$

17. The method as described in Claim 15, wherein the external vehicle torque ($T_{vehicle}$) of the vehicle when the clutch is just starting to slip and when clutch is disengaged is determined

20   according to the following formula:

$$T_{vehicle} = \frac{1}{i_A \cdot J_{eng}} \cdot \left(J_{vehicle} \cdot T_{eng} - sign\{\omega_{eng} - i_A \cdot \omega_{vehicle}\} \cdot \{i_A^2 \cdot J_{eng} + J_{vehicle}\} \cdot T_{clA}\right).$$

18. The method as described in Claim 15, wherein, if neither of the two clutches is gripping, the external vehicle torque ($T_{vehicle}$) of the vehicle is determined according to the following

25   formula:

$$T_{vehicle} = \dot{\omega}_{vehicle} \cdot J_{vehicle} - sign\left(\omega_{eng} - i_A \cdot \omega_{vehicle}\right) \cdot i_A \cdot T_{clA} - sign\left(\omega_{eng} - i_B \cdot \omega_{vehicle}\right) \cdot i_B \cdot T_{clB}.$$

19. The method as described in Claim 1, wherein, in an upshift in pulling mode or a pulling upshift, the engine torque (T_{eng}) is increased in order to develop a slip reserve and keep the motor speed above the speed of the old transmission input shaft that is assigned to the starting gear, the old clutch that is assigned to the starting gear is then disengaged with a constant ramp function and the new clutch assigned to the target gear is engaged with the same ramp function, the engine torque (T_{eng}) is reduced to a minimum in order to synchronize the engine speed with the speed of the new transmission input shaft that is assigned to the target gear, and the torque (T_{emotor}) of the electric motor is driven in such a manner that the vehicle acceleration desired by the driver is achieved.

20. The method as described in Claim 1, wherein, in an upshift in pushing mode or a pushing upshift, the engine torque (T_{eng}) is reduced to a minimum in order to synchronize the engine speed with the speed of the new transmission input shaft, the vehicle acceleration is driven with the old clutch, the old clutch is disengaged with a constant ramp function if the engine speed drops below the speed of the new shaft, the old clutch is disengaged with a constant ramp function if the engine speed drops below the speed of the new shaft, the old clutch is disengaged with a constant ramp function and the new clutch is engaged and the torque (T_{emotor}) of the electric motor is driven in such a manner that the vehicle acceleration desired by the driver is achieved.

21. The method as described in Claim 1, wherein, in a downshift in pulling mode or a pulling downshift, the engine torque (T_{eng}) is increased in order to synchronize the engine speed with the speed of the new transmission input shaft, the vehicle acceleration is driven with the old clutch, the old clutch is disengaged with a constant ramp function if the engine speed climbs above the speed of the new shaft, the old clutch is disengaged with constant ramp function and the new clutch is engaged if the engine speed climbs above the speed of the new shaft, and the torque (T_{emotor}) of the electric motor is driven in such a manner that the vehicle acceleration desired by the driver is achieved.

22. The method as described in Claim 1, wherein, in a downshift in pushing mode or a pushing downshift, the engine torque (T_{eng}) is reduced to a minimum in order to develop a slip reserve and keep the engine speed under the speed of the old transmission input shaft, the old clutch is disengaged with a constant ramp function and the new clutch is engaged with the same ramp function, the engine torque (T_{eng}) is increased in order to synchronize the engine speed with the speed of the new transmission input shaft, and the torque (T_{emotor}) of the electric motor is driven in such a manner that the vehicle acceleration desired by the driver is achieved.